Patent Application of

Timothy Scott Skipper

for

MODULAR LADDER

INCLUDING REMOVABLE RUNGS

CROSS-REFERENCES TO RELATED APPLICATIONS

This application is a non-provisional application claiming the benefit, pursuant to 37 C.F.R. §1.53 (c), of an earlier filed provisional application. The provisional application listed the same inventor. The requisite information as to the provisional application is as follows:

Application Serial Number	Filing Date
60/430,532	December 4, 2002

This application is also a continuation-in-part of Application Serial No. 10/162,022, which was filed on June 4, 2003, and which also listed the same inventor.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not Applicable

MICROFICHE APPENDIX

Not Applicable

BACKGROUND OF THE INVENTION

1. Field of the Invention.

This invention relates to the field of ladders and tree stands. More specifically, the invention comprises a modular ladder and hunting tree stand.

2. Description of the Related Art.

Modular ladders designed to allow the climbing of vertical objects such as trees are disclosed in several prior U.S. patents. Examples include U.S. Patent No. 5,040,635 to Strickland (1991); U.S. Patent No. 6,076,634 to Simon (2000); U.S. Patent No. 6,170,609 to Dech (2001); and U.S. Patent No. 6,340,071 to Dickemper (2002).

Likewise, tree stands allowing a hunter to remain in an elevated position are widely known. Examples include U.S. Patent No. 5,097,925 to Walker, Jr. (1992); U.S. Patent No. 5,862,883 to Carriere (1999); and U.S. Patent No. 6,246,000 to Johnson (2001).

BRIEF SUMMARY OF THE INVENTION

The present invention comprises a portable modular ladder which can be attached to a vertical object to be climbed - such as a tree. The ladder's structure is preferably provided by two or more vertical support columns locked together. These vertical support columns can be secured to the object to be climbed by a securing strap or other conventional means. A set of rungs extend outward from the vertical support columns. These rungs are optionally made removable, so that a user can remove the rungs and leave only the vertical support columns in place.

Several locking mechanisms are disclosed. These mechanisms prevent unauthorized use of the ladder by preventing the insertion of the rungs. A variety of configurations for the vertical support columns and the removable rungs are disclosed.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. 1 is an isometric view, showing a vertical support column.

FIG. 2 is a detail view of the object shown in FIG. 1

FIG. 3 is an isometric view, showing the addition of a securing strap.

FIG. 4 is a detail view, showing how the securing strap is attached

FIG. 5 is an isometric view, showing how the vertical support column attaches to a tree.

FIG. 6 is a detail view, showing the insertion of a removable rung into the vertical support column.

FIG. 7 is a detail view, showing the insertion of a removable rung into the vertical support column.

FIG. 8 is a detail view, showing the insertion of a removable rung into the vertical support column.

FIG. 9 is an isometric view, showing a stick assembly.

FIG. 10 is a perspective view, showing a completed ladder attached to a tree.

FIG. 11 is a perspective view, showing a completed ladder attached to a tree.

FIG. 12 is a detail view, showing a U-channel column.

FIG. 13 is an isometric view, showing the addition of an external lock to a vertical support column.

FIG. 14 is an isometric view, showing the addition of an external lock to a vertical support column.

FIG. 15 is an isometric view, showing the addition of an internal lock to a vertical support column.

FIG. 16 is an isometric view, showing the addition of an internal lock to a vertical support column.

FIG. 17 is an isometric view, showing the addition of an internal lock to a vertical support column.

FIG. 18 is an isometric view, showing an alternate embodiment for a removable rung.

FIG. 19 is an isometric view, showing the installation of the removable rung of FIG. 18.

FIG. 20 is an isometric view, showing another alternate embodiment for a removable rung.

FIG. 21 is an isometric view, showing the installation of the removable rung in FIG. 20.

FIG. 22 is an isometric view, showing another alternate embodiment for a removable rung.

FIG. 23 is an isometric view, showing the installation of the removable rung in FIG. 22.

FIG. 24 is an isometric view, showing the installation of still another alternate embodiment for a removable rung.

FIG. 25 is an isometric view, showing a split protrusion.

FIG. 26 is an isometric view, showing the installation of a split protrusion in a removable rung.

FIG. 27 is an isometric view, showing the installation of a removable rung having a split protrusion into a vertical support column.

FIG. 28 is an isometric view, showing the installation of a removable rung having a gusset.

FIG. 29 is an isometric view, showing a removable rung having a gusset.

REFERENCE NUMERALS IN THE DRAWINGS

10	tree	12	tree stand
18	securing strap	20	standoff
26	inclined hole	30	strap lock
38	removable rung	40	step
42	insertion cylinder	60	transverse hole
96	vertical support column	100	extension
102	receptacle	104	admission slot
106	leading protrusion	108	trailing protrusion
110	first wall	112	second wall
116	locking handle	120	slot
124	notch	128	alternate rung

130	third wall	132	fourth wall
134	stick assembly	136	U-channel
138	external lock	140	lock hole
142	tab	144	hook
146	lock	148	stabilizing protrusion
150	alternate rung	152	alternate rung
154	rib	156	alternate rung
158	linear offset	160	split protrusion
162	spring housing	164	spring
166	pressure plate	168	shaft
170	hole	172	alternate rung
174	spring receiver	176	alternate rung
178	gusset	194	first prong
196	second prong	198	notch
206	internal lock	208	base standoff

DETAILED DESCRIPTION OF THE INVENTION

This invention pertains to improvements made in my prior designs for modular climbing ladders. These prior designs are disclosed in detail in copending U.S. Application Serial Nos. 10/058,901 and 10/162,002, along with general descriptions of the operation of such devices. These prior copending applications are hereby incorporated by reference.

Modular climbing ladders are preferably portable. Thus, it is desirable to break the ladder into a series of shorter sections. FIG. 1 shows the primary structural element of the proposed modular ladder - designated as vertical support column **96**. It is made from a length of hollow square stock. The open upper end forms receptacle **102**. Extension **102** extends downward from the lower end. Extension **100** is designed to slide into a receptacle **102** on a second vertical support column **96** placed immediately below the one shown. Those skilled in the art will know that many equivalent interconnecting mechanisms could be used. As an example, a larger square sleeve could be substituted for extension **100**. This larger sleeve would then slide over the exterior of the upper portion of a vertical support column **96** sitting below the one shown.

Standoffs **20** are provided to separate vertical support column **96** a short distance from the object to which it is attached. The column is designed to accept a set of removable rungs. Spaced holes are provided for this purpose. FIG. 2 shows the upper portion of the column in more detail. Being a piece of square hollow stock, the column is comprised of first wall **110**, second wall **112**, third wall **130**, and fourth wall **132**. A set of inclined holes **26** pierces first wall **110** and third wall **130**. A second set of inclined holes **26** pierces second wall **112** and fourth wall **132**.

The outward facing side of each inclined hole **26** - meaning the side facing away from the standoffs - includes an admission slot **104**. The reader will observe that the inclined holes are inclined from the horizontal. In other words, for the set piercing first wall **110** and third wall **130**, the intersection of the hole with first wall **110** is higher than the intersection with third wall **130**.

In use, each vertical support column must be attached to the object to be climbed (typically a tree). FIG. 3 shows the addition of securing strap **18** to the column. The two ends of the strap incorporate hooks **144**. These are passed around the square section, preferably in the vicinity of the

standoffs so that the standoffs will help hold the hooks in place. The overall length of the strap is adjusted by pulling it through strap lock **30**. Strap lock **30** can then be cinched in order to maintain the desired length. FIG. 4 shows the attachment of the two hooks **144** in more detail. The two standoffs, preferably being made of "C-channel" tend to hold the hooks in position so that the strap does not slide up and down the column.

FIG. 5 shows vertical support column **96** attached to tree **10**. Securing strap **18** has been passed around the tree, pulled tight, and locked into position by strap lock **30**. For the vertical support column **96** which is to be placed on the ground, it is advantageous to provide a second set of standoffs. These are designated as base standoffs **208** in the view. They distribute load to the ground to prevent the column from sinking in. They also tend to properly orient the column with respect to the tree. The reader will observe how the standoffs prevent the column from being pulled directly against the tree. Those skilled in the art will also realize that the "Vee" shape of the two standoffs will rotationally stabilize the column with respect to the tree.

Rungs must be attached to each vertical support column in order to facilitate climbing. The rungs are preferably made removable so that a user can prevent unauthorized climbing. FIGs. 6 - 8 show the process of installing a typical removable rung. Removable rung **38** includes insertion cylinder **42**, and an angularly offset step **40**. Leading protrusion **106** extends outward from insertion cylinder **42** in a position distal to the step. Trailing protrusion **108** extends outward in a position adjacent to the step. It is angularly displaced from leading protrusion **106** by 180 degrees.

To start the insertion process, the user inverts the run in order to align leading protrusion **106** with admission slot **104** (as shown in FIG. 6). The user then pushes insertion cylinder **42** into inclined hole **96**. The user continues advancing the insertion cylinder into the hole until leading protrusion

106 comes up against the inner surface of the far wall. The user then begins rotating the rung in order to align trailing protrusion **108** with admission slot **104**. FIG. 7 shows the rung after it has been rotated through 90 degrees of the 180 degrees needed. FIG. 8 shows the rung after it has been rotated 180 degrees. At this point, the user pushes the rung inward, allowing trailing protrusion **108** to come to rest within admission slot **104**. The leading and trailing protrusions are spaced apart a distance which ensures that when leading protrusion **106** is hard against the inner surface of the far wall, trailing protrusion **108** lies within admission slot **104**.

Those skilled in the art will therefore realize that the rung is prohibited from rotating. The position shown in FIG. 8 is very stable. The user places his or her foot on step **40** to climb. This weight tends to force insertion cylinder **42** further into inclined hole **26**. Thus, leading protrusion **106** is pressed firmly against the inner surface of the far wall. This fact also ensures that trailing protrusion **108** is held firmly within admission slot **104**. The reader will appreciate that each wall of the column has thickness - typically .090 to .150 inches. The side walls of the admission slot bound the movements of the trailing protrusion.

FIG. 9 shows vertical support column **96** with securing strap **18** in place and a set of removable rungs **38** installed (collectively designated as stick assembly **134**). The reader will observe how the inclined holes alternate between the first and second walls, resulting in the rungs being displaced 90 degrees in the installed position. This rung spacing is preferable, since it allows the column to be placed close to the tree - thereby enhancing stability - while still allowing clearance for the forward portion of the user's foot when he or she is standing on a rung. The 90 degree rung separation also permits the use of smaller standoffs, which makes for a more compact overall design, as well as obvious material savings.

FIG. 10 shows four complete stick assemblies **134** attached to a tree. The lowest vertical support column is equipped with a second set of standoffs near its base (as shown in FIG. 5). The stick assemblies **134** are in place to provide access to a prior art tree stand **12**, which is independently attached to the tree. FIG. 11 shows the same assembly from a different perspective. The reader will observe how the removable rungs **38** are well clear of the tree, even with the use of the relatively small standoffs **20**. The rung orientation also allows the user to more easily step off the ladder and onto the tree stand.

Those skilled in the art will realize that the rung sets can also be spaced 180 degrees apart (although larger standoffs will likely be needed). FIG. 12 shows a different type of column, designated as U-channel column **136**. It only has three walls. It does not need a fourth wall since only two walls are pierced by the inclined holes. The insertion and action of the removable rungs is the same as was described for FIGs. 6 - 8.

Other variations in the rung and column design are possible. FIG. 18 depicts alternate rung **128**, which uses a step which is aligned with the insertion cylinder (It lacks the angular offset). Such a step is designed for a hole which is not inclined. Thus, additional features are needed to secure the step in place. Stabilizing protrusion **148** is added between leading protrusion **106** and trailing protrusion **108**. FIG. 19 shows alternate rung **128** in the installed position. To install it, the user first aligns leading protrusion **106** with admission slot **104** and advances the rung into transverse hole **60**. The user continues advancing the rung inward until stabilizing protrusion **148** clears admission slot **104**. The user then rotates the rung 180 degrees to align trailing protrusion **108** with admission slot **104**. The reader will observe that a portion of the insertion cylinder sticks out beyond the far wall (third wall **130**). If the rung is pulled outward accidentally, stabilizing protrusion **148** will bear

against the inner surface of first wall **110** before the insertion cylinder slips out of the far wall. Thus, the rung will not become accidentally dislodged.

FIG. 20 shows the same addition applied to a rung with an angularly offset step **40** (designated as alternate rung **150**). FIG. 21 shows alternate rung **150** installed. Stabilizing protrusion **148** prevents insertion cylinder **42** being accidentally pulled outward. The only way to remove the rung is to pull the insertion cylinder out enough to pull the trailing protrusion out of the admission slot, then manually rotate the rung in order to align stabilizing protrusion **148** with admission slot **104**.

Of course, the function carried out by leading protrusion **106** and stabilizing protrusion **148** can be performed using different geometry. FIG. 22 shows alternate rung **152**, which substitutes rib **154** for leading protrusion **106** and stabilizing protrusion **148**. FIG. 23 shows this embodiment installed. Those skilled in the art will realize that the rib performs the same function, having essentially just filled in the gap between the leading and stabilizing protrusions (the gap serving no real purpose). The rib may actually be a bit easier to slide through the admission slot than the two separate protrusions.

FIG. 24 shows alternate rung **156**, in which step **40** is linearly offset from insertion cylinder **42** by the addition of linear offset **158**. This linear offset tends to keep the rung in the orientation shown, since the user's weight on the step will naturally rotate the step to its lowest position relative to the insertion cylinder. A stabilizing protrusion **148** (or equivalent rib) may also be added to inhibit unintentional dislodgement of the rung.

More complex devices for securing the rung in its installed position are also possible. A spring-loaded protrusion can be substituted for trailing protrusion **108**. FIG. 25 shows split protrusion **160**. Spring housing **162** (the front half of which is shown cut away for visual clarity)

houses a spring **164**, which bears upward against movable pressure plate **166**. Shaft **168** extends upward through hole **170** in spring housing **162**. First prong **194** and second prong **196** are attached to shaft **168**, joining to form notch **198**.

FIG. 26 shows the installation of split protrusion **160** in spring receiver **174** (simply a blind hole) of alternate rung **172**. Spring housing **162** is press fitted, threaded, glued, or otherwise secured in spring receiver **174**. The spring then urges shaft **168** upward. Although, if one presses on notch **198**, one is able to press it downward against the spring force.

FIG. 27 shows the installation of alternate rung **172**. The user must first align leading protrusion **106** with admission slot **104**, then advance the insertion cylinder through the hole. The user then rotates the rung 180 degrees and aligns split protrusion **160** with admission slot **104**. The user must then depress the movable parts of the split protrusion so that first prong **194** passes into the interior of the column. The user then releases the movable parts. The spring then snaps notch **198** up against the top of the admission slot (as shown in FIG. 27). In this position, the rung will not rotate or back out. In order to remove the rung, the user must again depress the moving portions of split protrusion **160** and pull the rung free.

FIG. 28 shows yet another alternate embodiment, designated as alternate rung **176**. This rung features a gusset **178**, which is positioned to bear against the outside of first wall **110** when the rung is stepped on. FIG. 29 shows gusset **178** from another angle. The other rungs shown transmit load to the vertical support column through the interaction between the insertion cylinder and the holes in the column's walls. Alternate rung **176** also transmits a load via having the portion of gusset **178** facing the viewer in FIG. 29 bear against the outside of first wall **110**. One or more additional protrusions may also be used.

The reader will note that many of the examples have shown a vertical support column having only three walls (a "C-Channel" or "U-Channel"). Many of the embodiments shown will work for three walls as well as four. Some, in fact need only two walls, although the desire for column strength makes at least three walls preferable.

In some applications it is desirable to leave the ladder in place. Yet, the user may wish to prevent unauthorized climbing by other people. One way to accomplish this is by removing the rungs. However, other persons may be in possession of the rungs. Thus, an additional security measure is desired. FIG. 13 shows external lock **138** next to vertical support column **96**. External lock **138** is configured to cover first wall **110** and second wall **112**. It has lock hole **140** near its lower end, and two tabs **142** extending upward from its upper end (The use of only one tab is also possible).

FIG. 14 shows external lock **138** in position covering vertical support column **96**. The two tabs **142** have been slipped under the hooks **144**. Lock hole **140** has been aligned with the lowest inclined hole **26**. Lock **146** has been passed through this hole, thereby securing external lock **138**. Thus, removable rungs cannot be installed. It may only be necessary to lock out the lowest vertical support column in order to effectively secure the ladder.

FIG. 15 shows a second type of locking device, intended to operate within the hollow interior of the vertical support column. Internal lock **206** comprises two walls forming a ninety degree angle. These are sized to slidably fit within the square interior of vertical support column **96**. Slot **120** is added to allow locking handle **116** to be accessed from outside. Internal lock **206** includes a series of notches **124**. These align with inclined holes **26** when internal lock **206** is in the unlocked position (In this position, locking handle **116** rests in the bottom of slot **120**). In the unlocked position,

internal lock **206** does not interfere with the insertion of the removable rungs. Lock hole **140** is provided to secure the lock in the locked position.

FIG. 16 shows internal lock **206** installed and in the unlocked position. As stated previously, notches **124** allow the insertion of the removable rungs. In order to lock the device, locking handle **116** is grasped and pulled upward to the top of slot **120**. FIG. 17 shows this position. Lock hole **140** then aligns with the lowest inclined hole **26**, allowing a user to insert lock **146** through the hole, thereby locking internal lock **206** in the locked position. All the inclined holes are blocked by the internal lock when in this position.

Although the preceding description contains significant detail, it should not be construed as limiting the scope of the invention but rather as providing illustrations of the preferred embodiment of the invention. Thus, the scope of the invention should be fixed by the following claims, rather than by the examples given.